Assessing the economic value of protecting artificial lakes

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Abstract
This study examines the current and potential economic value of an artificial lake aiming to explore the factors that affect people's willingness to pay (WTP) for its protection. The WTP was derived from a face-to-face survey of 564 residents and recreational users of the Plastira's lake, one of the most important constructed wetlands in Greece. We find a higher WTP of individuals towards the lake's functions and their desire to prevent possible diminutions of its total economic value and we show that the most important variable is pro-environmental behavior. It is also found that respondents have different behavior for lake's economic value according mainly to their origin (residents or recreational users). Using adequate econometric models to take into consideration the protest answers, we find changes in the influence of the explanatory variables compared to the usual simple binary model formulations. With the help of principal components analysis, four factors are extracted (water use, production, flora and fauna and quasi-option values) and their influence on respondents' WTP is explored. Demographic variables (like income, age, gender) together with the extracted factors have a strong impact on the decision of individuals to pay as well as on the specific amounts stated.

Keywords: Artificial lakes; contingent valuation; WTP; total economic value.

JEL Classification codes: Q50; Q51; C24.

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1. Introduction

Lakes are of the most important ecosystems contributing to the national and local economies by producing a wide range of goods and services supporting life (Turner et. al. 2000). This range includes food, water, regulating services that affect climate, floods, diseases, wastes, and water quality, recreational and aesthetic benefits, soil formation, nutrient cycling etc (MEA 2005). The identification of the importance and the wide variety of ecological and economic benefits that natural wetland ecosystems provide to humans (Turner 1999) increased the interest for creating new water ecosystems (artificial wetlands or lakes) for supporting human life (Hammer and Bastian 1989).

Constructed lakes are made aiming to substitute a natural lake's functions as water storage, flood retention, and water quality improvement for human benefit (Kadlec and Knight 1996). Artificial lakes are constructed for replacing also natural lakes ecological functions that additionally may provide a range of services beyond the main reason of its construction like support of recreational activities or aesthetic services (Benyamine et al. 2004; Knight et al. 2001).

The economic value of lakes is supposed to be high but is difficult to be assessed. Valuing all lake's benefits (goods and services) is a challenge and many times these ecosystems are undervalued because people cannot realize the range of products derived from them. Although lakes ecosystems support human life, many times people cannot conceptualize lakes' goods and services in economic and monetary terms. Protection and sustainable development of lakes and water ecosystems require efficient policies based on knowledge about its value among different classes of societies and different uses. This information can help to design powerful environmental policies by understanding the benefits and costs of proposed actions and their alternatives. Natural resources economists try to get information about the ways people hold economic values to environmental and water resources like wetlands.

Environmental economists estimate the value of natural and water resources based on amounts that people are willing to pay to protect or increase the resources' services. Many attempts have been carried out to evaluate natural ecosystem services of water resources (Alberini et al. 2005; He et al. 2005; Hougner et al. 2006; Brander et al. 2007; Costanza et al. 2007; Sattout et al. 2007) while there are also few attempts to estimate the value of artificial landscapes (Bolund and Hunhammar 1999; Tian and Cai 2004).

Sometimes artificial water ecosystems have higher direct than indirect use values by their construction (Yang et al. 2008). On the other hand, water ecosystems can be valued from several perspectives that lead to at least four different types of value: owner, user, regional, and social (Leitch and Hovde 1996). According to Roberts and Leitch (1997):

- Owner values are usually provided by marketable wetland products and services (e.g., forage, water, aquatic plants).
- User values are derived from consumptive or not use of wetland-related benefits (e.g., recreation, water quality enhancement).
- Regional values (e.g., gross business volumes, employment) are obtained from wetland-related business activity.
- Social values can be measured by aggregating user and owner values (Leitch and Hovde 1996).

Different environmental concern has been observed in different population samples (Dunlap et al. 2000). The objective of this paper is to investigate people's willingness to pay (hereafter WTP) for an artificial lake conservation by exploring the determinant factors that affect respondents' WTP and by giving emphasis to people's socioeconomic characteristics and attitudes towards their values. Specifically this paper helps to understand the way that different groups of people (visitors and residents) attribute economic values to an artificial lake. By using a Contingent Valuation Method (hereafter CVM or CV) it estimates individuals' WTP for protecting the lake and the surrounding area and explores how individuals' attributes affect their WTP. Finally, it investigates what motives are behind protest beliefs and what influence these protest beliefs have on both the decision to be willing to pay and the WTP amount stated.

To achieve these tasks, a random sample of 564 residents and recreational users of the Plastira Lake was used in a CVM framework. To our knowledge there is no study investigating the influence of various motives such as individual preferences and opinions about the total economic value of an artificial lake, the influential factors affecting the WTP for its protection as well as the effect of protest beliefs. A two stage decision process was applied to explore both the initial decision about whether or not to support a possible protection option followed by a subsequent decision for those choosing to support about how much to pay. Specifically advanced econometric model formulations that take into consideration the protest answers are used.

To tackle the refusals to pay (possible protest answers) we first employ a logistic model followed by a Tobit and then we apply the two hurdle model, assuming that the WTP and its intensity are two distinct decisions. A key difference is that the Tobit model relies on the assumption that the factors explaining the decision to be willing to pay and the intensity (amount) of this willingness have the same impact on these decisions. On the other hand the double hurdle permits these effects to be different. In the Tobit model the observed zeros are corner solutions and the decision to participate (WTP=1) is not relevant and only the intensity decision to participate is important. In the case of the double hurdle, zeros are corner solutions as well as abstentions and participation and intensity decisions are considered simultaneously. Tobit and Heckman models show a limited power to tackle zeros generation and interpretation.

According to Arabmazard and Schmidt (1982), if the normality assumption is not valid the estimates of maximum likelihood will be inconsistent and vulnerable to misspecification issues. One way to cope with non-normality of the disturbance terms is the use of a Box-Cox transformation of the dependent variable in a standard double-hurdle model formulation (Yen 1993; Jones and Yen 2000).

In this way we show that there are changes in the influence and the signs of the explanatory variables compared to the usual simple binary model formulations. Our findings show which factors influence the probability to participate and being willing to pay for the protection of the environmental quality. Thus the present paper provides policy makers with the necessary information for further improvements of the lake and its surroundings and draw concluding remarks and policy recommendations relevant to the existing conditions of the lake. The results help to understand the way residents and recreational users hold economic values to artificial lakes and it is shown that they have distinctive preferences for their conservation. Additionally the relationships between values and preferences for natural conservation are described.

The structure of the paper is the following. Section 2 provides the background information of the existing relative literature while section 3 discusses the study area, the survey design and the econometric and statistical methods proposed to tackle the problem. Specifically, it discusses the logistic regression together with the Tobit, standard double-hurdle model and its Box-Cox transformation. Section 4 presents the empirical results obtained together with the principal components analysis used to measure different public perceptions of total economic value and the adopted econometric models. This section ends discussing the meaning of these results in relation to the existing relative literature. The last section concludes the paper raising a number of policy implications associated with the extracted results.

2. Background

Wetlands attribute a large variety of values which are not always fully identified by individuals and societies (Oglethorpe and Miliadou 2000). It is important to understand the relationship between people's level of environmental concern and the types of behaviors they are likely to support as well as the way in which individuals hold environmental values in water resources. Social psychologists have been active in developing an understanding of the factors that determine individuals' environmental behavior (Kaiser et al. 1999). Many attempts have tried to explain individuals' environmental behavior with the help of theoretical models (Ajzen 1985; Schwartz 1992 and 1994; Winter and Locwood 2005). Many researchers have investigated different aspects of humans' environmental behavior and some of them have focused on environmental values (Stern et al. 1993; Stern and Dietz 1994; Spash et al. 2009). Values are important because they influence attitudes and behavior (Stern and Dietz 1994).

A typical approach to explain why individuals place values on a natural resource is based on distinguishing between those who use the resource and those who do not (Freeman 1993). As a result, total economic value is not only use value, but the sum of both use and non-use values. The Total Economic Value (TEV) framework in the context of water resources is divided into six categories: direct use value, existence value, indirect use value, option value, bequest value and quasi-option value (Pearce and Turner 1990; Spurgeon 1992; Hanley and Spash 1993; Pearce and Moran 1994; Turner et al. 1994; Bateman and Langford 1997; Barbier et al. 1997; Nunes et al. 2000).

A way to estimate the total economic value of a natural ecosystem is by extracting the willingness to pay (WTP) and willingness to accept (WTA) of individuals. WTP and WTA can be used in many methods for estimating the monetary value of ecosystems services but the most popular method is CVM. CVM is one of the most widely used non-market valuation technique for environmental goods and services due to its flexibility to provide appropriate estimations about use and non-use environmental values (Carson et al. 2001). In addition CVM is the only valuation method for non-use values of environmental goods and services (Loomis and Walsh 1997; Ahlheim, 1998; Bateman et al. 1999; Adjaye 2000).

CVM is one of the stated preference methods that is based on people willingness to pay (or willingness to accept) for hypothetical changes of environmental goods and services quality (Carson 2000). In CVM surveys people's WTP is elicited under hypothetical market scenarios (Lee 1997) with the use of a questionnaire. There are various formats for eliciting WTP with the dichotomous choice (or referendum) format to be considered as the state-of-the-art in CVM methodology. CV surveys have been used in the evaluation of large discrete changes such as the introduction of a new public good, the value associated with substituting one good for another, or the marginal value associated with changing one or more attributes of an existing good.

Many times in contingent valuation (CV) surveys, there are respondents who are not willing to pay any amount for an environmental public good. Some of them do not value the goods in question or they cannot afford to pay for them or refuse to accept the CV scenario. The respondents that give zero value or reject any CV bids are known as protest responses. Lindsey (1994) was the first author that systematically addressed the issue of the meaning of protest votes.

Protest answers are associated with opposition to valuation process (Jorgensen and Syme 1995; Jorgensen et al. 1999). According to Jorgensen and Syme (2000) sometimes people that cannot afford to pay are also, in some manner, against the valuation process. There are three reasons for protest answers in a CVM studies (Boyle, 2003) such as people objection to some part of the survey (e.g. refuse to pay any amount for a public good), strategic respondents' behavior for influence surveys results or lack of information about the good in question (Meyerhoff and Liebe 2006).

Surveys' questionnaire should include elements that help to distinguish between protest and respondents' attitude towards public goods. Sometimes protest are not only zero values but may include very high bits greater than respondents' value (Lindsey 1994; Meyerhoff and Liebe 2006).

According to Haab and McConnell (2002) in CV surveys with open–ended question format the number of "protest answers'' is commonly even as zeros or as very high values. On the other hand, zero protest bids is a particular problem for dichotomous-choice CV studies because a refuse to accept the given amount many times can be misinterpreted as willingness to pay less than the stated amount (Halstead et al. 1992).

A common way to remove protest responses from the analysis because significantly influence the results of valuation studies (Halstead et al. 1992, Whitehead et al. 1993; Mitchell and Carson 1989; Jorgensen et al. 1999; Morrison et al. 2000). Despite the importance of identification of protest answers, there is not an agreement of an appropriate protocol to separate "true" zero values from protest responses and then to treat adequately the protest responses (Meyerhoff and Liebe 2008; Boyle and Bergstrom 1999).

One of the most appropriate ways to identify protest responses is the respondents' answers to a set of follow-up attitudinal questions that examine their motivation for providing zero bids. The most possible reasons for protest answers is disagreement with some aspects of CV scenario like the payment vehicle (Morrison et al. 2000), ethical beliefs indicated (Söderquist 1998) and fairness aspects (Jorgensen et al. 2001). On the other hand the instruments used by researches to identify protest answers widely differ. Kotchen and Reiling (2000) identify as protesting answers which were opposite to CV scenario, believes that recovery efforts would not work and express of the opinion that should not pay for environment because is a public good.

According to Carson et al. (1995) over 2000 contingent valuation surveys have been done from over forty countries. Leitch and Ludwig (1995) point out that there are many examples of wetland valuation in the literature (Shabman et al. 1978; Gosselink et al. 1974; Batie and Wilson 1978; Lynne et al. 1981; Farber and Costanza, 1987). Ghermandi el al. (2010), using a meta-analysis to explore WTP for artificial wetland, mention the very limited number of studies estimating the economic values of artificial wetlands. Most of them have assessed the benefits of artificial wastelands with the use of CVM (Cravener 1995; Baron et al. 1997; Klein and Bateman 1998; MacDonald et al. 1998; Kirkland 1988; Verma 2001; Scherrer 2003; Meyerhoff and Dehnhardt 2004; Seguí 2004; Yang et al. 2008).

In Greece, to our knowledge, the number of CVM studies for evaluation of artificial wetlands is very limited. Oglethorpe and Miliadou (2000) used CVM to estimate the non-use attributes of Lake Kerkini. They have also examined the relationship between the revealed non-use values and some social characteristics and attitudes of people. Ragkos et al. (2006) using a CVM survey value Zazari–Cheimaditida wetland functions in terms of the goods and services providing welfare measures that reflect the value of these functions.

On the other hand previous psychometric research on this topic has commonly identified broad orientations, or collections of values, from the data. Anthropocentric (human centered), biocentric (ecosystem centered) and egocentric (self centered) orientations have been identified (Stern et al. 1993; Axelrod 1994; Steel et al. 1994; Kempton et al. 1995; Bjerke and Kalternborn 1999). Although orientations have proven to be useful, they have been unable to explain why groups such as farmers and wildlife managers possess similar orientations but widely divergent behaviors (Kempton et al. 1995; Bjerke and Kalternborn 1999).

3. Materials and methods

3.1. Study area

Lake Plastira is an artificial lake at the east side of Pindos Mountains in the Central Greece. It was constructed during the period 1958 - 1962 covering an area of 24Km^2. The Plastira's dam was constructed mainly for electric power production but it has also partially covered irrigation needs and water supply of Thessaly. Later, the site was designated as an environment conservation zone (is a Natura 2000 area) because of ecological (a wide variety of rare and/or under protection species of flora and fauna is present) and high aesthetic landscape values, while tourist activities have been developed around the reservoir. The area has also a rich history.

The Lake Plastira area despite its natural beauty had not been considered as an important resource for the local communities until 1988. After communities took the initiative to build the first hostels in the area, this was followed (around 1992-93) by increasing numbers of visitors in the area. The mainstream of visitors refers to "domestic" tourism, i.e. Greeks, visiting the area mainly during weekends and holidays. In general, an effort is undertaken to attract mainly 'special' types of tourists who will appreciate and preserve the environment while having the opportunity to enjoy the area through alternative sports (rafting, climbing, trailing, canoeing, horse riding, mountain biking etc.) and/or other activities (environmental information and training, garden and forest visits etc.).

3.2. Survey design

A contingent valuation survey was carried out to a sample of 564 randomly selected people, consisted of Plastira Lake's users. Face-to-face interviews were conducted on-site. Usually a CVM survey uses questions to elicit a person's WTP for a change in the supply of environmental goods. In this case, we were looking at changes in the quality of Plastira Lake natural environment.

For this reason a questionnaire was constructed and tested according to guidelines established by the NOAA panel (Arrow et al. 1993). After designing the first draft of the questionnaire, a pilot survey was conducted, in order to fully adapt the questionnaire at the conditions of the study area and to determine the range of different WTP amounts. The questionnaire had been divided into three sections delivered to respondents in the following order.

The **introductory part** introduced the respondents to the purpose of the study presenting all the necessary background information about the aim of the survey. At the same time it assured the respondents that their answers would be dealt with confidentiality. Next, s**ection 1** is a general information section where respondents were asked to provide information on their household like socio-economic status, gender, age, educational level, income level, number of dependents etc. In this section of the survey respondents were also asked to give information about general ecological attributes towards the environment.

In these lines, in **section 2** a hypothetical market was developed in which an individual reveals his or her WTP for protection of Plastira Lake environment. The structure of the hypothetical market involved three elements: (1) description of Plastira Lake and the related hypothetical scenario; (2) the form and frequency of payment and (3) the WTP question format. The question format was a voter referendum to approve this effort. Respondents were asked, prior to the WTP question, whether they would support a lake's improvement program. Implementation of the program would cost them a specified amount of money (in €) in a one-time payment.

In the second phase, the WTP was elicited only from people who had answered positively to the first question. This time respondents were asked if they were willing to pay a specific amount of money to confirm their participation. Specified amounts were randomly assigned to respondents. In the questionnaire of the pilot study an open-ended question format was included with the aim to specify the bit step amounts of the final questionnaire due to lack of previous valuation studies for the study area. The results of the pilot study show that the WTP amounts were fluctuated between 1 and 50 €. Thus, bit step amounts were used based on the results obtained in the pre-test and in the pilot study and ranged from 1 € to 50 € (bit step 3 €). Given this information, respondents were asked whether they would vote "yes" or "no" to approve this effort. Follow-up questions were asked to determine reasons for respondents' answers. As protest responses were considered those rejecting some feature of the hypothetical CV scenario rather than from an absence of value.

In s**ection 3 r**espondents were asked to indicate on a five-point Likert scale (Not at all, Not Much, Fairly, Much, Very Much) for each topic (Babbie 1989; Bell 1993) their opinion for the importance of 47 functions of the lake that examine views concerning the relationship between humans behavior and environmental values. The 47 functions were selected according to the connections between wetlands' functions and services that people value and were adapted by the National Research Council (NRC) at 1995. These functions were assumed that they can measure the six different categories of water resources economic values. Environmental economists had linked the functions and services that are provided by an environmental resource with their different types of economic values (Turner et al. 2000).

3.3. The proposed econometric models

We have collected data on a binary variable (1=Yes and 0=No) in their participation to protect the environment together with the amount that the respondents are willing to pay (WTP) as well as a number of independent variables. This binary variable with the associated significant independent variables may be first used in a logistic regression model formulation.

In this formulation, Y_i is the dichotomous variable taking the value of 1 (people are willing to pay) with probability Θ and the value of 0 (people are not willing to pay) with probability 1-Θ.[3] This random variable has a discrete probability distribution like

$$\Pr(Y_i, \Theta_i) = \Theta_i^{Y_i} (1-\Theta)^{1-Y_i} \qquad (1)$$

In our collected data the first n_1 out of n observations express WTP and so $Y_1=Y_2=\ldots=Y_{n1}=1$ while the rest of the observations do not and so $Y_{n1+1}=Y_{n1+2}=\ldots=Y_n=0$. The

[3] For more details on the properties and applications of logistic regression see Halkos (2011).

marginal distributions for the Y_i 's given the mutually independent $Y_1, Y_2, \ldots, Y_n$ have the likelihood function expressed as

$$L(Y;\Theta)=\left(\prod_{i=1}^{n1}\Theta_i\right)\left[\prod_{i=n1+1}^{n}(1-\Theta_1)\right] \tag{2}$$

Replacing Θ_i in (2) we derive the likelihood function as

$$L(Y;\beta) = \frac{\prod_{i=1}^{n1} e^{(\beta_0+\sum_{j=1}^{k} X_{ij})}}{\prod_{i=1}^{n}\left[1+e^{\left(\beta_0+\sum_{j=1}^{k}\beta_j X_{ij}\right)}\right]} \tag{3}$$

The slopes of the logistic model regression quantify the relationship of the explanatory variables to the dependent variable involving the parameter called the Odds Ratio (OR). These are defined as the ratio of the probability that WTP will take place divided by the probability that WTP will not take place. That is

$$\text{Odds } (E \mid X_1, X_2, \ldots, X_n) = \frac{\Pr(E)}{1-\Pr(E)} \tag{4}$$

The logit form of the model is a transformation of the probability Pr(Y=1) that is defined as the natural log odds of the event E(Y=1). That is

$$\text{logit } [\Pr(Y=1)]=\log_e[\text{odds } (Y=1)]=\log_e\left[\frac{\Pr(Y=1)}{1-\Pr(Y=1)}\right] \tag{5}$$

The usual problem in this kind of model formulation is the existence of protest zeros. A typical approach to cope with cases of data with many zeros is the Tobit model, as formulated by Tobin (1958). In the Tobit model the regression equation for the observed variable Y^* may be written as

$$Y^* = X'\beta + \varepsilon \qquad \varepsilon \sim N(0,\sigma^2) \tag{6}$$

The observed variable Y_i is connected to the latent variable Y^* as

$$Y = \begin{cases} Y^* & \text{if } Y^* > LL \\ LL & \text{if } Y^* \leq LL \end{cases} \quad \text{or} \quad Y = \begin{cases} Y^* & \text{if } Y^* < UL \\ UL & \text{if } Y^* \geq UL \end{cases} \tag{7}$$

where LL and UL the lower and upper limits respectively. The probability of an observation to be censored at the LL is

$$\Pr(Y^* \leq LL) = \Pr(X_i'\beta + \varepsilon \leq LL) = \Phi\{(LL - X_i'\beta)/\sigma\} \tag{8}$$

Where Φ(.) is the cumulative distribution function of the normal distribution. In the case of left-censored data with a censored point k the density function can be expressed as

$$f(Y_i) = \left(\frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{ -\frac{1}{2\sigma^2} \left(Y_i - X_i'\beta \right)^2 \right\} \right)^{g_i} \left[\Phi\left\{ (k - X_i'\beta)/\sigma \right\} \right]^{1-g_i} \tag{9}$$

Where g=1 a censoring indicator that the observation is not censored while g=0 a censored observation in the case of LL=g.

The marginal effect of a variable like X_1 on the expected value of WTP is calculated as

$$E(WTP) = \frac{\partial E(WTP)}{\partial X_1} = \beta\Phi(Z) \tag{10}$$

Where Z is calculated at the mean values of all variables. It is worth mentioning that the Tobit ML estimators are consistent if the errors are normally distributed and homoskedastic. In our case both assumptions are tested using proper Lagrange Multiplier (LM) tests.

Tobit model uses a censored dependent variable without considering the sources of the zero responses and ignoring the zero responses due to non-participation decisions or the protest ones. Cragg (1971) modified the Tobit model to tackle the problem with too many zero responses proposing the “double hurdle” model. Specifically, Cragg suggests the estimation of two hurdles with the first referring to the participation decision and the second to the level of participation. Hurdle models can be presented as

$$Y_i = \begin{cases} Y_{2i}^* & iff \ Y_{2i}^* > 0 \quad and \quad Y_{1i}^* > 0 \\ 0 & otherwise \end{cases} \tag{11}$$

Following Cameron and Trivedi (2009) and if we consider two latent variables Y_i^* and d_i^* as functions of observable explanatory variables X_i and Z_i the model becomes

$$d_i^* = z_i'\delta + \varepsilon_{1i} \quad \text{With} \quad (\varepsilon_{1i}, \varepsilon_{2i}) \sim N\left(0, \begin{bmatrix} 1 & \rho\sigma_\varepsilon \\ \rho\sigma_\varepsilon & \sigma_\varepsilon^2 \end{bmatrix}\right) \tag{12}$$

$$Y_i^* = x_i'\beta + \varepsilon_{2i}$$

Where the disturbance terms are independently and jointly normally distributed with covariance $\rho\sigma_\varepsilon$. Then we have two equations. The first hurdle may be expressed as

$$\begin{aligned} d_i &= 1 \qquad if \quad d_i^* > 0 \\ d_i &= 0 \qquad if \quad d_i^* \leq 0 \end{aligned} \tag{13}$$

While the second hurdle may be represented as

$$Y_i^* = \max(Y_i^{**}, 0)$$

Where the first shows if an observation is in the sample or not while the second determines the value of Y_i. In terms of the Tobit setup Z_i=X_i, δ=β, $\sigma_{\varepsilon_{1i}} = \sigma_{\varepsilon_{2i}}$ and ρ=1.

As the observed variable is $Y_i = d_i Y_i^*$, following Moffatt (2005) the log-likelihood for the double hurdle model can be expressed as

$$\log L = \sum \ln\left[1 - \Phi(Z_i'a)\Phi\left(\frac{X_i'}{\sigma}\right)\right] + \sum \ln\left[\Phi(Z_i'a)\frac{1}{\sigma}\Phi\left(\frac{Y_i - X_i'\beta}{\sigma}\right)\right] \tag{14}$$

The double hurdle allows the existence of zeros in the second hurdle and in the double hurdle WTP is determined in the participation equation.

A restriction of the double-hurdle model formulation is that it relies on the assumption of normality of the disturbance terms. If this assumption is not valid the estimates of the maximum likelihood will be inconsistent especially in cases with a highly skewed dependent variable (Aristei and Pieroni, 2008). Yen (1993) and Jones and Yen (2000) claim that a way to correct for problem of non-normality of the disturbance terms is the use of a Box-Cox transformation of the dependent variable giving:

$$Y_i^T = \frac{Y_i^\lambda - 1}{\lambda} \quad \text{with } 0 \leq \lambda \leq 1 \qquad (15)$$

The Box-Cox double-hurdle model formulation relies on the relationship between the transformed dependent variable and the latent variables Z and Y_i^*:

$$Y_i^T = \begin{cases} Y_i^* \ \ if\ Y_i^* > -\frac{1}{\lambda} \quad and \quad Z_t > 0 \\ 0 \quad otherwise \end{cases} \qquad (16)$$

Using this specification allows us to relax the assumption of normality on the conditional distribution of Y_i and at the same time it permits stochastic dependence between the disturbance terms of participation and intensity equations.

As the Tobit model is nested in the double hurdle model formulation we can test the use of the double hurdle model against the Tobit using a Likelihood Ratio (LR) test as (Humphreys, 2010),

$$LR = -2(LL_{DH}^* - LL_{TOBIT}^*) \sim \chi_p^2 \qquad (15)$$

Where p the degrees of freedom equal to the number of parameters restrictions in the Tobit formulation.

4. Empirical results and discussion

Table 1 presents the descriptive statistics of the respondents' socioeconomic characteristics while Table 2 displays analytically the reasons for not paying.

Table 1: Descriptive statistics of respondents' basic socioeconomic characteristics

	Residence			Visitors		
	Number of observations	Mean	Standard Deviation	Observations	Mean	Standard Deviation
Gender (%)	149	51.8% (Female)		315	53.5% (Female)	
Age (years)	246	38.39	13.36	306	34.82	11.45
Education level (years)	243	13.80	3.13	299	13.59	2.94
Mean Monthly income (€)	240	14152.50	6546.28	298	13638.93	7402.25
Marital Status	240	54.2% (Married)		315	54.0 % (Married)	

Table 2: Reasons for not paying in percentages (number of respondents in parentheses)

I'm not interested	2.3% (13)
Natural Environment protection is state responsibility	10.8% (61)
We pay through taxation	0.9% (5)
Environment is a public good	12.1% (68)
lack of confidence	0.7% (4)
I can't afford it	16.3% (92)
Total	43.1% (243)
Without reason	56.9% (321)
Total	564

4.1 Principal Component Analysis

Next, the Principal Components Analysis (PCA) was used as a tool for measuring different public perceptions with regard to economic dimensions of the Total Economic Value (TEV) of an artificial lake. Specifically, for this reason respondents were asked to indicate on a five-point Likert scale (Not at all, Not Much, Fairly, Much, Very Much) for each topic (Babbie, 1989) their opinion for the importance of 47 reasons holding economic value to Plastira Lake. Reliability analysis of the question revealed that Cronbach-*a* was 0.9723.[4] The PCA has extracted four factors explaining 69.17 % of the fluctuation of the total variance[5]. The Kaiser-Meyer-Olkin (KMO) criterion for sampling adequacy was equal to 0.954 and the Bartlett's test of sphericity was equal to 20914.389 (with a P-value of 0.000).

The results of PCA indicate that the respondents were not able to clearly distinguish between the established in the literature six types of environmental values from the set of items provided. Regarding the results of PCA it is obvious that the classification of the items was made according to the dimensions of ecosystem (water, fauna and flora, products etc). The four factors extracted from the PCA represent the way respondents appreciate and value the various services provided by the lake and their associated satisfaction derived mainly by their utilization.

In this way, the first environmental value - factor that was identified by the respondents represented «*lake's water use values*». This was the most important factor explaining 45.22% of the total variance in the data. Items load in the first factor are subjects related to direct and indirect use value, option and bequest water values. Common characteristic of all items is the use of Lake's waters for region water supply and irrigation, for energy production and for improving residents' life quality, both now and in the future.

It is worth mentioning that none of the first factor's items was associated with the recreational use of the lake, one of the main uses today. That is to say, for the respondents the economic value of the lake is mainly associated with the reasons for which it was originally created. It is obvious that participants in the research hold mainly instrumental value in it. Ecosystems may be valued differently according to

[4] The reliability level of Cronbach-*a* that is considered to be satisfactory depends on the stage of a research and the targets of the researcher. Usually indexes are considered to be satisfactory when they are higher than 0.6 (α>0.6) (Malhotra 2008) or 0.7 (Nunnaly 1978).
[5] The results of the PCA are not presented here but are available on request.

the type of value being activated, so there are two types of values, instrumental values and intrinsic values. According to O'Neill (1992) an intrinsic value is used as a synonym for non-instrumental value. Nature has instrumental values when is useful to people (Vilkka 1997). Similarly, Adamowicz (1995) claims that an instrumental value is related to both "direct use" (industry activities as mining, irrigation etc) and "indirect use" or "non-use" (indirect benefits for humans) of natural resources. The instrumental value of an entity incorporates its qualities that provide a benefit to humans, unlike intrinsic value, which is independent of its qualities such as rarity or "naturalness" (O'Neill 1992).

Taking into account the fact that Plastira Lake is an artificial one created nearly half a century ago, the empirical results are expected. The Lake was created in order to cover basic needs of the inhabitants of the region, related to the irrigation of the wider region and the production of energy. The original reasons for the creation of the Lake have been recorded in the consciousness of the inhabitants of the area so much that they cannot be predominated by other uses that have been generated over time (e.g. recreation).

It is obvious that residents, who have experienced the creation of the Lake, find it difficult to refrain from the instrumental value and attribute internal values. As far as they are concerned, the Lake is to a significant extend a means of satisfying their own needs and not so much a natural ecosystem. On top of that the results are quite expected because the direct use values are derived from direct personal use of the environment and are associated with benefits that are obtained from fish, aquaculture, fuel wood, recreation, transport, wildlife harvesting, peat/energy, vegetable oils, dyes, fruits, etc (Pearce and Moran, 1994).

The second factor that was identified by the respondents represented *«Lake's production values»*. Fish production of the lake had been proved as the most important item of this factor. Generally, all items of the second factor are mainly related to the use of the Lake's waters for producing goods. In practice, they are mainly related to both direct use and option value.

Direct use value refers to the economic dimension of a water resource and indicates people's willingness to pay for benefits provided by the wetland or the level of compensation they would expect for the loss of those benefits. Use values are derived from the actual use of water resources and they may include the use from various private institutions (industries, agriculture etc), various uses related to recreational activities and also scientific profits. The results proclaim the instrumental relation that respondents have with the lake.

On the other hand, issues related to the option value and especially with the future use of the Lake to produce goods loaded the second factor. Option values are associated with any possible future use of water resources and can be defined as the amount that someone is willing to pay, in order to be able to change his/her attitude in the future and use some of the environmental resources (Beaumont and Tinch 2003). This future use can be direct or indirect, but never expected. This is the reason for existing disagreement in the bibliography for the definition of the concept of potential value (Walsh et al. 1984: Hanemann 1989: Beaumont and Tinch 2003).

According to many researchers, the main motive leading people to attribute option value to the environment is the uncertainty of the existence of natural environment (Krutilla 1967; Johansson 1990). On this basis, potential value does not exist when there is uncertainty about the existence of the environment (Johansson 1990).

In the literature there are classifications of environmental values that include option value in non-use values (Hodge 1995; Hussen 2000). Option values are classified in the category of use values when individuals are related to direct future use of the environment (Sowerby and Grieve 2003). In the present research classification of issues related to the option value maybe similar to those of the direct use leading to the conclusion that there are cases in practice where people confuse these two values.

The third factor affecting respondents in attributing a value to Plastira Lake was called *«flora and fauna values»*. The items loading in this factor are connected with flora and fauna existence and (mostly indirect) use values. Indirect-use values associated with water resources include biological and global life supports, conservation and climate modulation. It is the first time that this factor is associated with intrinsic environmental values giving right of non human beings to exist. Existence values are defined as the benefit received from simply knowing that the resource exists even if non-use is made of it.

Actually it is the intrinsic value of resources and landscapes, irrespective of their use as cultural, aesthetic, bequest value, etc. Free-flowing rivers were one of the first examples of such resources with existence values (Krutilla and Fisher, 1975). Motives may range from a broad concern for the critical status of the nature to a desire to save higher mammals, or to altruism (McConnell, 1997). Avoiding extinction of endangered species was quickly recognized as one source of existence and bequest values (Meyer 1974; Randall and Stoll 1983; Stoll and Johnson 1984).

Pearce and Turner (1990) point out that existence value stems from different forms of altruism while according to Turner (1999) existence value is a special form of altruism. For some environmental economists, existence value is not only derived from altruism but sometimes stems from the knowledge that the resource can be related to other uses (Kolstad 2000) and environmental responsibility (Bishop and Welsh 1992). Randall (1986) points out that existence value has traditionally been associated with unique natural phenomena and also with irreversible damage.

The fourth environmental value that was identified by the respondents was called «Lake's *quasi-option value*». The items of the fourth factor are mostly associated with quasi-option and indirect use values of the lake. Quasi-option value was first introduced by Arrow and Fisher (1974) and is the value of information derived after a decision has been made to develop or conserve at the present time (Fisher and Hanemann, 1987) and must be distinguished from option value as it involves a different concept of economic value. The first group of motives explaining this factor consists of the area maintenance in case information for different potential uses of the lake (as production, genetic resources etc) increases. The "Quasi-option value" of the lake is associated with the fact that a value is attributed to the region because we will increase our knowledge in the future so that we can use it more. Quasi-option value is referring to future values of the lake so it is expected people to complicate these different types of environmental values.

Table 3 presents a Mann-Whitney *U* test conducted to evaluate the hypothesis that resident respondents would score higher values related to reasons of Lake creation compared to visitors. According to the literature these two samples of tourists and local residents are expected to have distinctive preferences for environmental settings (Regenberger 1998; Vail and Heldt 2004; Soguel et al. 2008). Looking at these results, residents and visitors had different behavior against dimensions of the economic value of the lake. This is a proof that residents, who have experienced the creation of the Lake, find it difficult to refrain from the instrumental value and attribute internal values.

Table 3: Results of the nonparametric Mann-Whitney test

	Residents /Visitors	Mean Rank	U	Z	p
Water use value	Residents	282.23	29781.0	-2.530	.011
	Visitors	248.49			
Production value	Residents	210.14	21678.0	-7.208	.000
	Visitors	306.26			
Flora and Fauna use	Residents	220.23	24039.0	-5.845	.000
	Visitors	298.17			
Quasi-option value	Residents	214.36	22665.0	-6.638	.000
	Visitors	302.88			

4.2 Econometric results

In order to analyze the effect of the explanatory variables on WTP we have run different models. All variables included in the models to explain the WTP were also used in other similar surveys and they are justified by the economic theory. Table 4 presents the results of the various model formulations. As can be observed all respondents' demographic characteristics are not statistically significant in all models. On the other hand the extracted factors are significant in all models.

Our interest is in terms of the main effects and for this reason we have omitted possible interactions. Working with the most statistically significant variables we ended up to the following logit model formulation:

LOGIT [Pr(Y=1)] = $\beta_0 + \beta_1$ Marital Status + β_2 Gender + β_3 Years of Education +

+ β_4 Income + β_5 Income^2 + β_6 Environmental Behaviour + β_7 Water Use value +

+ β_8 Production value + β_9 Flora and Fauna value + β_{10} Quasi-Option value + ε_t

where Y in the logit formulation denotes the dependent variable as 1 for expressing WTP and 0 for not expressing WTP; ε_t is a disturbance term. The results of the fitted model are presented in Table 4 and in the first column. It can be seen that not all the variables included in the Logit model had anticipated signs. As can be observed all demographic variables (except age) have statistically significant effect on the probability of respondents answering ‘yes’ or ‘no’ to the valuation question.

Respondents’ pro-environmental behavior is positively affecting WTP. On the other hand the factors derived from the PCA and represent people’s opinion about different dimensions of lake’s economic value are also statistically significant and positively influential except in the case of the third factor. Specifically, the variables years of education, environmental behaviour, water use and production values are significant in all the usual statistical levels (0.01, 0.05 or 0.1). The variables income, Flora and Fauna and Quasi-Option values are statistically significant at the levels of 0.05 and 0.1 while the variables income square and marital status are statistically significant at the 0.1 level. The constant term and the variables gender and respondents’ origin are statistically insignificant.

The adjusted odds ratio in the case of environmental behavior is 4.2 and in the years of education 0.9. This implies that the odds of expressing WTP is about 4.2 and 0.9 times higher for an individual with environmental behavior and an additional year of education respectively.

The percentage change in the odds $\pi = \frac{\Pr(Y=1)}{\Pr(Y=0)}$ for every 1 unit in X_i holding all other X’s fixed can be also computed. For instance, in relation to the water use value (Factor 1) the odds of expressing WTP increases by about 60% ceteris paribus. Similarly, in the case of Flora and Fauna value (Factor 3) the WTP increases by about 31% for individuals with interest in protecting the natural environment holding constant the rest of the variables. It is worth mentioning that the percentage change in the odds from a monetary unit change in income is tiny (0.00002).

The overall significance of the model is given by X^2=116.72 with a significance level of P=0.000 and 10 degrees of freedom. Based on this value we can reject H_0 (where H_0: β_1= β_2=…=β_{10}=0) and conclude that at least one of the β coefficients is different from zero ($X^2_{0.05,10}$=18.307). The Hosmer and Lemeshow value equals to 10.37 (with significance equal to 0.311). The non-significant X^2 value indicates a good model fit in the correspondence of the actual and predicted values of the dependent variable.

Similarly, in the Tobit and the double hurdle models the open-ended response data with positive and true zero responses were used as dependent variables, giving us a mean estimated WTP. Table 4 presents the results of the Tobit model formulation in the second column and these of the double hurdle in the last column. The signs of the variables change compared to the logit model formulation. This change in signs is more likely to be related to the proper consideration of the protest zeros in the sample.

In the case of the Tobit model we can observe that all demographic variables are statistically significant except of the origin variable. Specifically, the constant term and the variables age, income and its square, environmental behaviour and water use, production and quasi-option values are significant in all the usual statistical levels (0.01, 0.05 or 0.1). The variables marital status, gender and Flora and Fauna use are statistically insignificant.

The signs of gender, education and environmental variables have changed as well as the signs of all the environmental values (extracted factors) except the one related to flora and fauna importance. Environmental behavior is the most influential variable with negative importance. Age, education years and income are positively influential as well as all the extracted factors except from the first. Gender, environmental behavior and marital status are negatively affecting WTP.

The marginal effects of age are equal to 0.212 implying that a change from one interval class to the other will decrease WTP by 21.2%. Similarly the marginal effects of income are really negligible and equal to 0.001. The marginal effect in the case of production values (factor 2) is 2.151 showing that a change from one interval class to the other will increase WTP by 2.151. It is worth mentioning that both tests on normality and homoskedasticity indicate serious problems and this leads us to extend our analysis to the consideration of the double hurdle model formulation.

In the double hurdle model formulation results we can see that at the first hurdle the only demographic variables which are statistically significant are income and environmental behavior with positive and negative signs respectively. The origin of the respondents is negatively influential for the first time. Finally all factors are statistically significant with negative sings except from the quasi-option value. Specifically, in the first hurdle the constant term and variables income and its square together with water use and production values are significant in all the usual statistical levels (0.01, 0.05 or 0.1). The variables origin (residents/visitors), environmental behaviour and Flora and Fauna values are statistically significant at the levels of 0.05 and 0.1 while quasi-option value is statistically insignificant.

In the second hurdle, the variables origin, income and the three first environmental values (extracted factors) are positively while age and the fourth factor are negatively influential. The signs of the variables are again as expected. The variables residents/visitors and factors 1, 3 and 4 are significant in all the usual statistical levels (0.01, 0.05 or 0.1). The variable income is statistically significant at the levels of 0.05 and 0.1 while the constant term and the variable age are statistically significant in the level of 0.1. As can be observed the importance of the origin of the respondents and the three of the four extracted factors are statistically significant in all levels of statistical significance. Regarding the demographic variables, income, educational level and gender are also statistically significant explanatory variables.

Finally, Table 4 presents the likelihood ratio results for comparing the appropriateness of using double hurdle against Tobit with the double hurdle model formulation to be preferred. According to the extracted results income has a turning point at which respondents' WTP changes. Specifically, this leads us to an inverted U-shaped behavior with a turning point equal to about 13000 (or around 1100€/month) as shown in Figure 1a. This is also confirmed by the income graph (Figure 1b) where it is expected that after the turning point the percentages of respondents who are willing to pay are lower because of the lower percentage of higher income amounts.

Figure 1: The inverted U-shaped curve from the derived results

(a) (b)

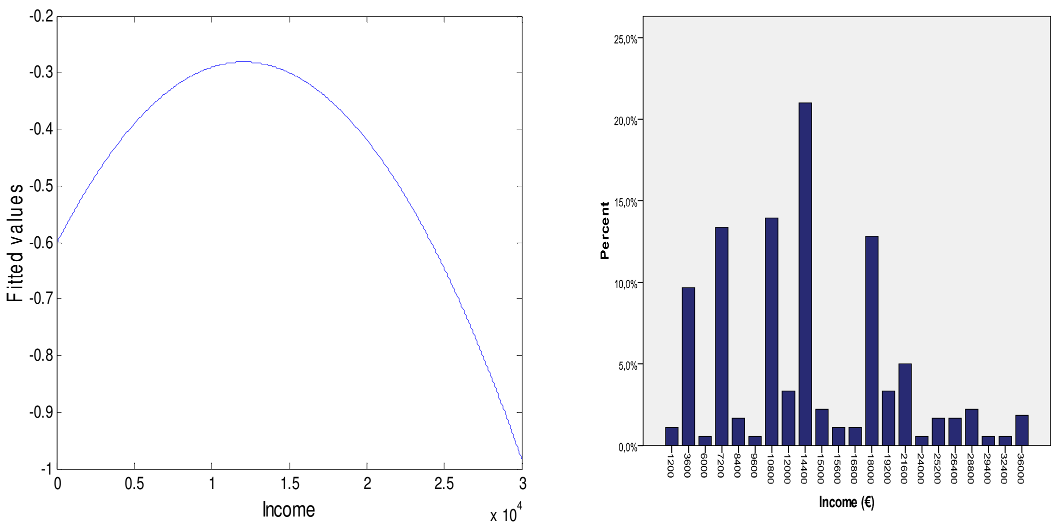

Table 4: Econometric results of the proposed models

	Logit		Tobit		Box-Cox Double Hurdle	
Variables	Estimates	Odds Ratios	Estimates	Marginal effects	First Hurdle	Second Hurdle
Constant	0.5025 (0.94) [0.346]		13.945 (2.63) [0.009]		-6.435 (-4.2) [0.000]	-1.2188 (-1.89) [0.059]
Age			0.22554 (2.75) [0.006]	0.212		-0.0077 (-1.68) [0.093]
Marital status	-0.29688 (-1.90) [0.057]	0.74313	-1.058 (-0.84) [0.403]	-0.995		
Gender	0.2987 (1.38) [0.167]	1.3482	-1.7276 (-1.16) [0.249]	-1.6241		
Residents/ Visitors					-0.5874 (-2.24) [0.029]	1.379 (4.43) [0.000]
Education in years	-0.1141 (-2.89) [0.004]	0.8922	0.4183 (1.56) [0.120]	0.3933		
Income	0.000053 (2.14) [0.032]	1.00002	0.0024 (3.78) [0.000]	0.001	0.00263 (8.99) [0.000]	0.000063 (2.93) [0.017]
Income^2	-2.19E-09 (-2.89) [0.083]		-6.14E-08 (-2.77) [0.006]		-1.07E-07 (-6.58) [0.000]	
Environmental Behavior	1.43403 (6.28) [0.000]	4.1956	-6.597 (-4.16) [0.000]	-6.1514	-0.5874 (-1.95) [0.029]	
Water use value (Factor 1)	0.46852 (4.09) [0.000]	1.5976	-1.935 (-2.61) [0.009]	-1.8189	-9.4479 (-4.04) [0.000]	1.0559 (6.39) [0.000]
Production value (Factor 2)	-0.32152 (-2.87) [0.004]	0.7251	2.288 (2.85) [0.005]	2.151	-3.4816 (-3.75) [0.000]	
Flora and Fauna use (Factor 3)	0.27285 (2.48) [0.013]	1.3137	1.15997 (1.56) [0.118]	1.09	-3.241 (2.52) [0.012]	0.5146 (8.34) [0.000]
Quasi-option value (Factor 4)	-0.2305 (-1.98) [0.048]	0.7942	3.3704 (4.23) [0.000]	3.1684	3.1923 (1.62) [0.105]	-0.3993 (-2.75) [0.006]
Turning points	12100.5		19544		12829.7	
Pseudo R^2	0.18					
LR χ_{10}^2	116.72 [0.000]					
Hosmer-Lemeshow	10.3662 [0.311]					
Normality Homoskedasticity			180.6 [0.000] 208.1 [0.000]			
Wald LR (rho=0)					50.99 [0.000]	
Log-Likelihood	-269.5		-653.811		-1049.765	
LR DH vs Tobit			791.908			

t-values in parentheses and P-values in brackets.

4.3 Discussion

Brouwer (2000) points out that studies including populations with different socio-economic characteristics and carried out at different geographical sites typically produce different outcomes. Regarding the influence of gender to intention of individuals to pay and according to our Logit analysis, gender has a positive effect. The positive coefficient of the gender variable with male being the reference point shows that male respondents expressed higher WTP for the lake protection than female and have greater possibility to say "yes" to survey scenario. Many studies (McStay and Dunlap 1983; Mohai 1992; Dietz et al. 2002) proved that gender influences environmental attitudes and moreover this influence is peculiar when related to local issues (Blocker and Eckberg 1989).

The picture of the empirical findings is mixed. Some scholars claim that men are more active, knowledgeable, and concerned about the environment compared to women (McEvoy 1972; Arbuthnot 1977; Blocker and Eckberg 1989; Arcury et al. 1987; Arcury 1990) and hold higher environmental values (Kealy et al. 1990; Swallow et al. 1994; Cameron and Englin 1997). Other researchers have identified that women show a greater concern for the natural environment compared to men (Mohai 1992; Zelezny et al. 2000; Kopelman et al. 2002; Karpiak and Baril 2008) and pay more for the environment (Davidson and Freudenburg 1996; Bord and O'Connor 1997; Hunter et al. 2004). At the same time, Brown and Taylor (2000) find not any gender difference.

Motherhood and the need for child protection are motives behind gender differences (Torgler et al. 2008) of course this is opposite to Zelezny et al. (2000) strong evidence that environmentalism does not begin in adulthood. For other researchers differences in gender in environmentalism can be ascribed to different perception of the world rather than different priorities (Merchant 1992; Salleh 1993; Seager 1993; Stern et al. 1993; Lough 1999). In our case, gender is a negative influence for WTP in the Tobit analysis.

Education influences people behavior as a surrogate for income, or socioeconomic status (Greenberg et al. 1995). Education impact on WTP was found not in line with the established theory and others studies in the Logit analysis while it is according to previous studies in the Tobit analysis. In many studies the level of education or the degrees a person has obtained influence his (her) response for the quality of the environment (Blomquist and Whitehead 1998; Engel and Pötschke 1998; Witzke and Urfei 2001; Veisten et al. 2004). So it is expected that people with higher level of education can understand the need for managing environmental resources better than others who are not well educated (Langford et al., 1998).

In our findings and in the Tobit analysis, age had a negative significant effect on WTP similar to several other studies (Zarnikau 2003; Wiser 2003; Rowlands et al. 2003; Diaz-Rainey and Ashton 2007). This implies that in general, younger have a higher WTP compared to older people. A possible explanation of negative age correlation with the willingness to contribute to additional environmental protection is that older people are not interested because they feel not able to live and enjoy the long-term benefits of preserving resources (Whitehead 1991; Carlsson and Johansson-Stenman 2000). Sometimes younger people are more concerned about the environment (Howell and Laska 1992) and older people may not be able to contribute much due to several reasons like more expenditure on health, strong preference for alternative recreation activities or economic dependence after their retirements etc.

Our results are also in line with many other CV studies (among others, Machado and Mourato 1998; Landry et al. 2003). The strong relationship between age and environmental concern (Nord et al. 1998) can be justified from different socialization, life experiences and economic conditions among different age-cohorts (Vlosky and Vlosky 1999). In previous CVM studies, the age variable had both negative and positive effects on people's WTP. On the other hand many researchers have found positive correlations between age and environmental concern and behaviour (Buttel 1979; Cottrell 2003; Fransson and Garling 1999; Honnold 1984; Howell and Laska 1992; Van Liere and Dunlap 1980).

Regarding the intention of individuals to pay, the highest percentage of positive answers was presented by the residents according to the first hurdle model while in the second hurdle respondents' origin still has a positive relation with WTP. This means that the probability of being willing to pay was higher in respondents from surrounding area than those from urban areas. According to Brander et al. (2006) the values of natural and artificial wetlands increase with the population living in the surrounding area.

Marital status has a negative influence to WTP in all model formulations. The negative coefficient for marital status implies that married respondents are less willing to pay for lake protection.

Our empirical analysis illustrates also the positive effect of income on respondents' WTP. According to Schläpfer (2006) the measurement income effects in a CV research counts the change in stated willingness to pay due to a change in income. For Mitchell and Carson (1989) the positive income effect on respondents' WTP is an indicator that they have into consideration their budget constraint. Generally income has unusually low effect in CV studies. Schläpfer (2006), using a meta-analysis, explores the effect of income in a sample of 64 CV studies including 83 valuation scenarios with only 30 valuation scenarios to present significant effects.

Finally according to our results the most socially notable variables connected with the decision of individuals to state an amount is environmental behavior with both positive and negative influences. According to the results of previous studies, individuals with strong environmental attitudes tend to result in higher percentage to give higher values for environmental conservation (Carson et al. 2001; Kotchen and Reiling 2000). Many times environmental attitude is related to higher education (Klineberg et al. 1998; Casey and Scott 2006).

With the help of the extracted factors we explore how the level of importance that people place on different lake's aspects (motives for holding economic value to the lake) may yield additional insight to explain individuals' WTP for its protection. Scodari (1990) claims that a number of valuation methods are unable to indicate properly the relationships between attribute functions and outputs of wetlands as well as the wide variability of wetland characteristics. Boyer and Polasky (2004) linked wetland functions with its revealed values and mention that wetland's value is positively related with flood control, water filtration, bird (or other wildlife) watching and habitat for endangered species. Ghermandi et al. (2010) also find that artificial wetland ecosystems are highly valued for flood control, storm buffering, and water quality improvement. Additionally, Ghermandi et al. (2010) claimed that artificial wetlands are valuable because they are a natural habitat for biodiversity.

5. Conclusions

This paper uses primary data to analyze the determinants of WTP for protecting an artificial lake. The proposed models used lake's environment quality parameters, associated with its economic value, to study the way that people value water resources and how people characteristics influence their WTP for the environment. There are numerous attitudinal studies which target to relationship between differences in environmental concern and respondents' demographic and socioeconomic characteristics like origin, social class, income, race, gender and age.

A lack of information on the Plastira Lake values has possible contributed to wetland degradation. While information on lake values provides important inputs for decision making regarding lake management, there seems to be no study on non-market values in this region. Our study fills this information gap by investigating people's willingness to pay for lake conservation using a CVM approach. Personal interviews were conducted in the users of the lake. It is found that respondents have different behavior for lake's economic value according mainly to their origin (residents or recreational users) and demographic characteristics or their opinion for lake's attributes.

Throughout our study a number of social and economical factors influencing the environmental behavior of individuals were explored. The influence of these factors on WTP amount was also investigated with the presence or not of protest answers. Regarding the results the factors of the model have a different influence according the presence of protest answers. In conclusion, an important finding of the study is the influence of lake's functions on people WTP for its protection.

The information provided by our study is very important as tool not only for Plastira's lake decision makers as is may help the considerable debate upon whether current economic procedures can accurately measure non-use values and, more fundamentally, whether these values exist and have an important role in decision making. The results also explain why individuals place values on a water resource and moreover give answers on how people's environmental behavior changes with pro-environmental attitude, gender, age, education level and the relation with the resource under valuation.

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